

# A COMPLETE GUIDE FOR BUILDING AN INTERVIEW RECORDING ROOM

Interview recording may seem like "quite a simple process". The reality is way more complex...

# WHITE PAPER

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JUNE 2021

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# **1** Interview Room Considerations

#### **1.1** Interview recording procedure

Interview recording may seem like "quite a simple process". All that is required is to start a recording while interviewing a suspect or a victim. The reality is way more complex! The reason for recording interviews is to gather information leading to the conviction of criminals. It is important to be able to retrieve, play, annotate, share, and distribute recordings. Now, if this is attempted with a recording application that has not been tailored to law enforcement, the result will most likely be a waste of time, money and more importantly, a failure to convict. The overall cost will far exceed that of a professional interview recording system. A professional interview recording system must be simple to use. The system must be highly intuitive, so that any officer can start an interview recording by simply pressing a single button. It must be able to integrate metadata information for easy retrieval, and finally to integrate flagging and annotation information, in order to identify any specific point in the interview.

#### 1.2 Audio and video performance

We all understand the importance of high-definition cameras to accurately capture body posture and facial expression. But, we often forget that audio performance is even more important than video. Low quality audio capture will result in poor interpretation of what is being said. This could be disastrous when presenting evidence before a judge. There are a wide variety of cameras to consider, from HD-SDI, USB and IP, each one offering fixed or PTZ (Pan, Tilt and Zoom) capabilities. All camera types have their pros and cons when considering quality and the ability to synchronize to audio. There is also the consideration of deciding if the cameras are to be visible or hidden. Finally, about the lens; do you need a wide-angle lens to capture the whole room, one that can zoom in on the suspect, or one capable of doing both? All of these factors are crucial in making the correct choice.

#### 1.3 Managing your recordings

Most interview recordings are stored on DVDs or on a hard drive. Today's technology offers video library applications, which save a substantial amount of time storing, retrieving, and distributing recorded interviews. There are many considerations when deciding to acquire a video library system. First, will recordings be maintained in-house or on a cloud-based solution? Both of these solutions have their pros and cons. Features that need to be considered include ease of access, security from hackers accessing the content, reliability to retrieve the content, protection and recovery in case of disasters.

### 1.4 Distribution and compatibility

Recordings are as good as their capacity to be shared with others. I once heard a situation where an interview recording was distributed on a blue ray disc. At the trial, the defendant's lawyer complained of being unable to view the video. The judge rejected this evidence. Whatever technology is being used to record interviews, it is crucial that the recording adheres to industry standards, allowing anyone to review the material without the necessity of installing third-party software.

### **1.5** The physical interview room

We often forget to consider the physical characteristic of the interview room when acquiring interview recording technology. The objective of the interview is to obtain information from suspects, victims, or witnesses. The interview room environment plays an important role in achieving this. Old, austere looking rooms with bolted chairs to the floor have been shown to be a poor way of soliciting information. Today there are two types of interview rooms: the hard room and the soft room. The hard room is designed to interview suspects and is normally not too comfortable. It has been determined that a level of discomfort will cause the interviewee to become more fatigued and liable to cooperate quicker. The soft room is considerably more comfortable, sometimes using couches helps create an environment more conducive to interviewing victims.

There is also the sound proofing consideration. First, it is important that the interview is not disturbed by outside noises such as cell phones, door slams, or conversations. Insulating the room from exterior sound is essential. Second, the restricted dimensions of a standard interview room can create echo. Echo appears negligible for a person within the room because the human brain can discriminate and block out unwanted sound. It is not the same for a microphone that can't distinguish between what you want to hear and what you don't. The installation of acoustic tiles prevents sound from bouncing from the walls. Finally, the same applies for the ventilation system. For a human standing inside the room, the sound of a ventilation system is insignificant, but again, not for the microphone. It is important to employ techniques to attenuate these unwanted noises.

# 2 How to select your equipment

#### 2.1 Financial considerations

It is usual that your budget that defines the type of equipment you can afford. It is important when estimating the funds required to finance your project, that nothing is overlooked. The highest cost of law enforcement is the work force. The time saved using the correct technology will make a huge difference. The answer to overworked police officers is not more staff, but better technology. Modern interview room technology will save time (and money) in preparing, recording, searching, sharing, and distributing interviews.

For smaller budgets, the use of smart phones or cameras available at a consumer electronic retailer may satisfy commercial interviewing, human resources, loss prevention and private security for non-governmental operations and non-governmental personnel. These "non-law enforcement" type systems can be more difficult to use and less intuitive, and if used in a law enforcement environment, can lead to chain-of-custody issues.

#### 2.2 Cameras

There are three main types of cameras that are used for interview recordings: IP, USB and HD-SDI. We will compare each of them and provide their pros and cons.

#### 2.2.1 IP Cameras

IP stands for Internet Protocol. IP cameras are the most popular on the market. These cameras are designed for surveillance, easy to install and can be located at considerable distances. To install an IP camera, simply connect it to an Ethernet router. There is no need for power since the router will provide it via a technology called PoE (Power over Ethernet). Because of its popularity within the surveillance market, there are a wide variety of IP cameras available, from fixed position to PTZ (Pan, Tilt and Zoom), mounted in dome, bullet or hidden cases. You will find whatever type you require by making a search on Internet.



Figure 1 - IP Camera 1



Figure 2 – IP Camera 2

#### How it works

The IP camera captures the video via a sensor chip and encodes it to an h.264 video streaming format. The video is encapsulated into packets. Connected to the internal Ethernet router, these packets are then accessible by any computer connected to the router (or worldwide if the router is configured accordingly). This allows more than one computer to have access to these packets. The packets are then recognized by a software that decapsulates the video content, generating the video on the computer screen.



Figure 3 – IP Cameras audio and video capture

#### The pros

There are a variety of IP cameras available. The video generated is already encoded in h.264 allowing manufacturers to develop many applications for it. It is also easy to install and configure.

#### The cons

IP cameras are designed for surveillance that does not require very high quality. They generate video and audio of a poorer quality than other types of cameras. The cause of their poorer quality comes from the way the signal is encoded. The encoding is created from a small chip installed in the camera. Because of the cost benefit, the algorithm used in IP cameras offers a much lower quality video output. The audio output of an IP camera is even poorer. The audio connection type in an IP camera is unbalanced. This type of audio connection provides a smaller bandwidth, and the audio cable cannot be longer than 12'. The result is poor audio quality, creating issues such as bad distinction between hearing the letters "S" or "F". (See more information in section 3.1.)

Most interview recording installations will bypass these audio issues by connecting the audio directly to the recording computer. But because the video is sent in packets and the audio in real time, it is not possible to perfectly synchronize the two together. The result creates a situation where the lips are not synching with the voice during playback. See Figure 3.

Because this technology connects to the internal Ethernet router, if there is a breakdown on the network, all the interview rooms will be out of service.

Finally, because IP cameras are network connected, they are more vulnerable to external hacking.

#### 2.2.2 USB Cameras

USB cameras are becoming more popular. Like IP cameras, there is a wide choice available from fixed, PTZ, dome, bullet, hidden and more. This type of camera is designed to connect directly to your computer via a USB port. It is widely used for teleconferencing, classroom recording or other applications such as FaceTime or Skype.





Figure 6 - PTZ USB Camera



Figure 4 – USB Pine Hole Camera



Figure 7 - Varifocal USB Camera

#### How it works

Like any camera, the USB camera captures the video with its sensor. Contrary to the IP camera, the USB camera does not encode the video in h.264 format. This process is done by a software install on the computer. The encoding software uses a more advanced encoding algorithm, which generates superior audio and video quality than the IP camera. However, the length of a USB cable cannot be longer than 15'. Similar to the IP camera, the USB version offers either an integrated microphone or unbalanced audio inputs.

The advantage of USB technology is that many devices can simulate a USB connection. For example, software can be installed on the computer that will generate a USB stream, allowing you to record the screen. It is also possible to convert an HDMI connection to USB, providing the ability to simultaneously record a monitor installed in an interview room. This could, for example, allow the recording of a smart phone.

#### The pros

USB cameras are widely available. The quality of the video is acceptable for interview recording. The limitation of the 15' cable is overcome by using a USB extension module, which will provide up to 330' between the camera and the computer. Because USB technology utilizes the real time transmission of video, it is possible to connect the audio directly to the computer and get full synchronization between video and audio. This type of camera can be used for either fixed or portable interview recording technology.

#### The cons

The weakness of USB cameras comes from the fact that the encoding occurs in the computer. This means greater utilization of the CPU. Depending on the computer, the number of simultaneous recordings can be limited to six. The USB technology happens to be less stable than the HD-SDI technology. A disconnection and reconnection of the USB cable is required to stop and subsequently restart the recording application.

#### 2.2.3 HD-SDI cameras

HD-SDI stands for High-Definition - Serial Digital Interface. This technology was developed and still being used by television stations today. The SMPTE (Society of Motion Picture and Television Engineers) created this format for the highest possible quality of video and audio required by broadcasters. This technology provides a stunning result when encoded in h.264 format. To obtain such an outcome, the video is encoded using hardware encoders installed in the computer. The hardware encoder uses the

foremost algorithm to provide the highest quality output that is ideal for law enforcement purposes. Because fewer applications exist outside of the broadcast industry, the range of HD-SDI cameras are more limited. There is a choice between fixed bullet, fixed dome, and PTZ (Pan, Tilt and Zoom) dome. Therefore, during interview recording where hidden cameras are not required, these options are more than suitable.



Figure 9 - HD-SDI Multifocal Camera



Figure 8 - HD-SDI PTZ Camera

#### The pros

This is the best technology for interview recording. HD-SDI technology provides the highest audio and video quality and offers excellent stability. There is perfect synchronization between audio and video. HD-SDI technology can record monitor screens. The connection of the audio is balanced audio that provides the highest bandwidth and the clearest sound quality.

#### The cons

Because of the hardware encoder card, this solution is more expensive and the varieties of cameras available are limited.

#### 2.3 Lenses

The choice of lenses is important. We sometimes consider the quality of a lens by its capacity to zoom, but this is not so in an Interview Room application. Specific to interview rooms, the wide-angle capacity of the lens is more important than how close it can zoom onto an object. Subsequently, there is no requirement to zoom on an object that is only 1" in size.

It is important that within the interview room there is one camera that covers the whole space. This is to ensure that the subject cannot claim to be threatened by an officer, whilst outside the field of view of the camera.

It is also useful to have another camera that can zoom closer on the subject, and have the ability to record body language, facial expression and reactions.

Finally, if it could be a benefit to be able to record smaller objects such as a phone or documents.

When looking at camera specifications, it is useful to examine the optical zoom capability of the camera. This specification will determine how close it can get to an object and its width of the coverage.

There are many parameters to consider in determining the angle that the camera will cover. A rule of thumb is to multiply the distance to the object in meters by 4.8, then divide by the width yourequire. The result will provide the focal lens parameter needed in mm.



#### Example:

The room measures 3 meters by 3 meters.

In order to record the whole space, you will need a lens that covers 90 degrees, if it's installed on a corner. The focal lens calculation shows a horizontal coverage of 4.24 meters, at a distance of 2.12 meters from the camera.

By using this formula in Figure 10, a lens with a focal distance of less than 2.4 mm is required. The less the focal lens, the wider the coverage.



As previously discussed, it is also important to have a second camera that can zoom closer in on the subject.

In the 3 meters by 3 meters interview room, to capture both the interviewee and the interviewer, will require a camera that has a focal lens of 7.2mm. See Figure 11.



Figure 11 - Camera covering the table

To record the interviewee's facial reactions, a camera lens with a focal distance of 14.4 mm is required. See Figure 12.



Figure 12 - Camera covering the interviewee



Figure 13 - Camera recording a smart phone

To summarize, in an interview room, obtaining two cameras is the minimum requirement. One fixed with a focal lens of 2.4 mm installed in the corner of the room, and another on the wall that has a 20X focal lens varying between 4mm and 120mm.

Finally, for recording smaller objects such as a smart phone, a camera that has a focal lens of

96 mm is required. See Figure 13.

Finding cameras with these exact specifications can be difficult, but one can get close enough. For example, for the corner camera, one with a focal lens of 2.8 mm will work. It is not ideal, but it will suffice.

# 3. Audio Considerations

Audio is more important than video. An interview is more about what the person says rather than their behavior in the interview room. For this reason, it is crucial that we put particular emphasis on the audio process.

### 3.1 Balanced audio vs Unbalanced audio

To properly capture the human voice, it is important to obtain all the bandwidth frequencies that are emitted by the person's voice. For this reason, it is imperative that all audio components, wirings and connections are in a balanced form and not unbalanced.



Figure 15 - Balanced audio Cable



Figure 14 - Unbalanced audio Cable

It is important to understand that an audio cable acts as an antenna. Our environment is invaded by electromagnetic frequencies coming from power supplies, transformers, neon lights and so on, that are induced into the audio wires, producing a background noise as can be seen on figure 16.



Figure 16 - Unbalanced audio signal

In the case of balanced audio, instead of having a single wire to drive the audio, there are two. The audio signal is transmitted on two wires, which have a phase shift of 180 degrees between them. The two wires are "twisted" together to ensure that the same noise will be induced in both wires at the same time.



Figure 17 -Balanced audio signal

In figure 18, we have represented noises by small waves for explanation purposes. Note that the small waves are in phase for both A+ and A- sides while the audio signals are out of phase relative to each other.



What happens when we subtract the signal (+ A) and the signal (- A)? Concerning the audio signal, subtracting one signal from another, corresponds to adding them if we shift (-A) signal of 180 degrees. Therefore (+A) - (-A), becomes (+A) + (+A) which results in an increase double A signal, as shown in figure 19. In regards to the noise signal, given that both signals are absolutely identical when you do the subtraction between the two, they cancel out one another completely.

Audio signal

Noise

Figure 19 - Result when we subtract: (+A) - (-A)

The result is a perfectly clean audio signal, destitute of any electromagnetic induction.



Figure 20 - Result when we subtract: (+A) - (-A)

It is essential to have an audio signal without induced noise. Since noises mainly affect high frequencies, a reduction in the high frequencies will make it difficult to distinguish between the "S" and "F". This will make virtually incomprehensible records where the suspect does not speak well.

Another consideration is the difference in amplitude signals between balanced and unbalanced cables. The amplitude of a balanced signal is 4 volts while the amplitude of an unbalanced signal is 1 volt. The loss in amplitude in an audio cable is in volt per length. In a twenty-foot cable, the loss averages .5 volt. At the end of a twenty-foot balanced audio cable, you will lose .5 volt on 4 volts that is a loss of 12.5 % while the loss of an unbalanced audio cable is .5 volt on 1 volt which is a loss of 50%.

### 3.2 The choice of microphone

There are three common types of microphones available: the cardioid, the unidirectional and the omnidirectional. A cardioid microphone is made to capture the voice of someone that has a microphone in their hand. The unidirectional microphone is to capture sound coming from a specific direction. The omnidirectional microphone is to capture audio in a room. So, the microphone best suited for an interview room is an omnidirectional microphone. See Figure 21.

Because of the restricted size of an interview room that is for example 10 x 10 feet, usually one omnidirectional microphone installed in the ceiling is more than sufficient to capture every sound in the room. Some interviewers will prefer to have a second microphone near the table, but by experience, it is generally not required.

It is important that the microphone is designed to capture high-quality speech. Make sure it is equipped with a 3 pin XLR connector and requires phantom power to operate. The microphone is at the very beginning of the audio process and its quality must not be neglected.

#### 3.3 Microphone Patterns

### **Microphone patterns**



#### 3.4 Audio Equalizer

Very often, interview rooms are equipped with a ventilation system. It is barely perceptible for a person standing in the room, but once recorded, the sound becomes very obvious. To reduce the frequencies generated by the ventilation system, use a multiband audio equalizer. This system manages all frequencies that are recorded. To setup, simply put on headphones, raise the volume to maximum, and vary the different frequency bands on the equalizer until you find the ones that alter the sound to the best possible result. It will not be perfect, but will be much improved.



Figure 22 - Audio Equalizer

#### 3.5 Other considerations

There are other considerations to ensuring an optimal audio recording: Eliminating echo in the room and unwanted noise coming from outside the room.

We will cover those two issues in chapter 8 "The physical room".

# 4 The Interview Recording Software

There are not many companies that manufacture professional Interview Recording Software. This application is very specialized and demands specific expertise, especially in the domain of security. The objective of acquiring Interview Recording Software is to save time and money. You can find the list of Interview Software Manufacturers in section 11.

#### 4.1 Ease of use

One of the main characteristics of the software is to be intuitive. It is common for an external officer to use the interview room. Beginning a recording must be simple and not require technical assistance. A recording should start with a simple press of a button and should require a form of confidence to confirm to the officer that the session is being recorded.

#### 4.2 Live streaming

It is quite common during an interview that other team members outside the room need to monitor the progress of the interview. For this purpose, all cameras inside the interview room must be accessible and viewed externally. A secure connection is required with a username and password to make sure that only authorized team members have access to the streaming.

### 4.3 Video formats (picture in picture or multi-Screens)

The advantage of multiple video screens is that all videos can be shown in full size. During playback, users can choose to view all video simultaneously, or full screen only. It has the disadvantage of utilizing more space on the hard drive, but with the actual encoding technologies, storage is not a concern. In both technologies, it is crucial for the recorded interviews to playback in a specialized application. You also need all the searches, annotations, thumbnails, and other functionalities to simplify your investigations.



### 4.4 Annotation functionalities

To speed up investigations, the application software must include annotation functionalities. During or after the interview, it must be possible to enter information to facilitate the retrieval of important segments. Simple tags are not sufficient to retrieve a segment. With this process, going from one tag to another takes too much time. It is important for the application to allow for annotation entries to be tagged with a date and time. It is also essential for the system to be able to generate thumbnails of the action in the interview room. This allows for quick retrieval of a specific moment during the interview.



annotations

Figure 24 – Multiple streams video format with Annotations

### 4.5 Confidence monitoring

An important feature of an excellent interview recording application is its capacity to undertake confidence monitoring. Normally, the only way you know the session has been properly recorded is by playing it back. There is always a small percentage of doubt that the session may not have recorded properly, especially concerning the audio levels. Confidence monitoring erases any doubt. While recording, the system will almost simultaneously read the recorded track, and play it back in your monitor. The delay between the live action and the playback in the monitor is around 5 seconds. With this technology, one knows in advance, with confidence (and not after the interview is concluded) that the recording is effective.

### 4.6 Playback application

In order to playback the recording, this specialized application needs to display important information about the video: the audio vu meter, the annotations, and the thumbnails. The application must allow fast forward, rewind, pause and jump functionalities. It is also suitable to have an application that does not require the installation of third-party software.



Figure 25 – Interview record Application

### 4.7 Retrieving and Distribution of interviews

Ultimately the importance of interview recording software is not during the interview, but after. Once the interview has concluded, it must be quick and easy to retrieve the recording among the thousand sin the storage facility. Simple metadata information entered during or after the interview provides classification information for easy retrieval. The software must have the capability for reviewing, finalizing, and distributing the information. Being able to transfer a file through a thumbnail key or a DVD is effective, but offering a temporary link is even a better solution. The temporary link has the advantage that the files cannot be copied, and the link can be removed whenever required.

# 5 Touchscreen Monitor

A touchscreen monitor in an Interview Room becomes a crucial tool for managing interrogations. Conducting an interview is about confronting the interviewee with evidence. Evidence is generally presented on a piece of paper, but this information is normally not recorded. It is therefore not possible to prove what documentation was presented to the interviewee during replays.



Figure 26 - Touchscreen Monitor

A touchscreen monitor in an interview room that allows the recording of evidence should be an option. With a monitor, many applications can be recorded, including:

- Presenting a document or a picture.
- Presenting a video.
- Showing a position on Google Maps.
- Recording a smart phone.
- Drawing something.
- Identifying a type of car.
- Choosing among a list of individuals.
- Asking a victim where they have been touched on a virtual mannequin.
- Conducting a Skype interview.
- And more.

A touch screen monitor that incorporates an internal computer may be expensive, running between \$3,000 to \$5,000 depending on the size of the screen and the type of computer. It is possible to acquire a standard monitor screen where you can you install a touch overlay. The total cost will vary between \$600 and \$800. Therefore, you need to plan for a laptop computer to be installed in the control room to feed your monitor. Also, because of the distance between the monitor and the laptop, it may be necessary to install USB to Cat5 extenders since the length of a USB cable is limited to 15 feet.



Figure 27 - Inexpensive Touchscreen installation

# 6 Portable Interview Recording

A portable interview recording application is an essential tool for law enforcement entities. Very often, interviews need to be performed by law enforcement or legal professionals outside of a traditional interview recording room. Consider common situations where the suspect or witness is in a hospital or in custody, or even more sensitive scenarios where the victim or witness is a minor, has suffered a sexual assault, is the victim of, or witness to domestic violence, or simply cannot be interviewed in a typical law enforcement setting.

When interviewing a child or victim of sexual abuse, a familiar setting such as the comfort of their own home is preferable. An environment where a victim or witness feels secure will reduce stress and put them more at ease. This will make it easier for them to discuss the event-in-question more frankly; to provide greater detail; and to better recall important facts.

In the case of a domestic assault, it is imperative that the interview occur as close to the time of the crime as possible, while events are still fresh in their mind. A timely interview visually documents their emotional state and captures any signs of trauma limiting the opportunity for their testimony to be influenced by others and secures valuable statements before a victim or witness can reconsider cooperating with the authorities.



### PORTABLE INTERVIEW RECORDING

White Paper A Complete Guide for Building an Interview RecordingRoom

# 7 Hardware considerations

With the expression "software" inevitably comes the word "hardware". All software requires hardware to work.

This is a very important point; many interviews are by definition very sensitive. Reliability is a key factor within the interview room. Reliability is not only about confidence that the recording will occur, but also that the recording is occurring in that moment. The interview procedure is prepared and ready, the suspect is waiting in the interview room, and everything is ready to go but the recording system will not start. Momentum is completely lost; the team is frustrated, and the interview suffers accordingly.

Computer manufacturers are constantly in a race to produce the most powerful hardware, with the most storage, the fastest microprocessor speeds, etc. In our scenario, the most important feature of any computer is reliable technology.

Industrial computer manufacturers make the most reliable hardware. Very often, the components used are not necessary the latest versions available, but the most reliable. Also, at the end of any electronic production run, quality control grades each component. The ones of lesser quality are sent to the consumer market, and the best are reserved for the industrial market. This is the reason buying industrial grade computers are more expensive. However, in the long run, the reliability and durability of industrial computers will last far longer and are therefore more cost effective.



Figure 29 – Industrial Computer

# 8 The video library

The video library is an important application. As mentioned before, the investigation process begins after the interview is completed. A video library stores, searches, retrieves, monitors, modifies and distributes media content. The role of the video library is to save time and money by allowing instant access, wherever and whenever the information is required.



Figure 30 – Video Library

#### 8.1 Video library features

A new video library should not be exclusive to interview recordings. It is a significant investment, and it is preferable to centralize all your media in one place.

### 8.2 Metadata information

Metadata information is used for classifying all media. It consists of information such as the date and time, the type of media, who recorded it, the location, the names of people involved and so on. The objective of metadata is to easily retrieve information. For example, trying to locate an interview, which occurred in San Diego between 2018 and 2019, concerning a murder that involved Bob Smith. Only if all the metadata information was entered correctly will the retrieval be successful.

The metadata information must be configured to your specific needs. All law enforcement entities have their own requirements. It is not possible to make one size fits all. The expression "too much is not

better than not enough" is very applicable when concerning the amount of metadata information in a video library system. Imagine trying to complete a document, but guessing which fields are important to fill in and which are not. It is important to configure the metadata information, so it includes only the proper information.

It is vital that your Video Library supplier allows for full configuration of metadata information.

### 8.3 Media files compatibility

Your media library must be compatible with all media files wherever they have originated. The media can be audio or video from interview recordings, surveillance cameras, smart phones, videotapes, bodycams, broadcasts and more. When specifically dealing with surveillance cameras, their file formats are often proprietary and cannot play with just any computer software.

A good video library system will manage two types of files, the original and the proxy. A proxy is a copy of the original in a particular file format, ideally h.264. The idea of the proxy is to have one common file type for monitoring and research purposes. Before a judge, the original file needs to be presented, but when conducting an investigation, avoiding time searching for video evidence is useful. The same applies for videotapes. Keep the original tape in storage, and a copy uploaded to the video library. It is important for the video library to manage, upload and download the original file when required. There is no need to make a proxy of a file that is already in h.264 format.

### 8.4 Annotations

We mentioned the importance of metadata information. Being able to annotate is just as important. The interview recording software (section 4.4) details how crucial it is to annotate interview recordings, but the same applies for all videos uploaded to the video library.

When searching for information in the video library, the ability to insert time stamp annotations is very useful. This will save a great deal of time for any investigator working on a case.

### 8.5 Security

The same security features mentioned in the interview recording software section, applies to the video library as well. But further elements need to be added when information is centralized and accessible to more people.

It is important to create different user configurations that control access. For example, group A only has access to content A, but not access to group B's content; or limiting some user types to just having read-only access. The configuration types can be almost unlimited, are very secure and can be connected to

the active directory for ease of access. Many security features such as: prevention of multiple active login sessions; access control based on each user's privileges; protection in case of multiple invalid login attempts; automatic logout of inactive users after 30 minutes; enforcement of minimum password complexity; and using an encrypted secured connection to access the system, must be implemented.

The system must allow for ad-hoc reporting. It is important to have access to reports detailing the database utilization. The video library holds sensitive information that needs to be controlled. Reports must include all information about who accessed the database, when and where, what information was viewed, what video was downloaded and more.

### 8.6 On-premises solution vs. Cloud

This is a question that IT administrators need to address. Cloud storage is becoming the norm, but is it really the best solution for law enforcement? Let us compare both solutions with their pros and cons in order to determine which solution is best for you.

To start, there are no differences, software and application wise, between an on-premises and cloudbased solution. Both solutions offer the same metadata information, the same media files compatibility, the same annotation features, and the same security characteristics. So, what is the difference between the two? Cost wise, based on a five-year period, both solutions are very similar. The on-premises solution will cost more to start, but after five years, the cloud solution will become more expensive.

### 8.7 On-premises video library

An on-premises video library is an application installed at your location. It involves your computers and hardware storage. Normally, your Information Technology specialist (IT) will install a "Virtual Server" on your existing hardware including an SQL application and video library application. Subsequently, if your IT specialist configures the library correctly, it becomes a corporate cloud application. Cost wise, normally on-premises applications are purchased and owned, with ongoing annual fees for updates and maintenance.

#### 8.7.1 The pros

The pros mainly concern security. Many law enforcement entities are reluctant to have sensitive information outside of their physical control. Cloud applications are secure, but there are ongoing fees to consider. In the long term, an in-house facility is less expensive.

#### 8.7.2 The cons

The short term is more expensive as all hardware and software needs to be procured as well as ongoing maintenance costs. Finally, there is a question of Internet access. If you always access the library from your internal Ethernet network, all is good. But if you require investigators to access the database from outside your internal network, the Internet connection will need updating to a much higher upload speed, to allow many users access to the video library at the same time.



Figure 31 – Equipment room

### 8.8 Cloud video library

The cloud has the same features as an on-premises installation except the application is based outside your locations in a "Data Center". The Data Center is not your provider, it is a service purchased by your provider. Your provider rents rack space in the Data Center where the hardware is installed. The provider also rents a huge upload Internet connection allowing them to service many customers at the same time. The benefits of the Data Center are the enormous pipeline of data it can provide, and the high levels of security to access the environment.

The cloud service is generally offered on a monthly payment program. Naturally, the provider will require a signed contract and will charge for configuration and installation.



Figure 32 – Data Center

#### 8.8.1 The pros

Short term it is less expensive, as there is no need to purchase equipment and staff-time to implement the solution. The connection to the library will be much faster and accessible worldwide by many users simultaneously.

#### 8.8.2 The cons

The solution will cost more on a long-term basis. Even though the solution is very safe, there is a security issue perception, due to the fact that people other than your own staff are in charge of the hardware.

# 9 The physical room

Police departments need to improve the way interview rooms are designed. It is important to remember that the objective of interviewing a suspect is to obtain confidences. It is much easier to talk freely during a one-on-one conversation if there is no distraction coming from outside the room, such as a ringing phone or a slamming door that are highly disruptive to the process.

#### 9.1 Interview room location

It is important to try to place the interview room far away from usual precinct distractions. In any case, the space must be soundproofed from noise coming in or out of the room. Sound travels through air, so if all air infiltration is blocked, there should not be any sound interference. Even if this is so in theory, it is not the same in reality. Low frequencies can create a movement on walls and doors, that reflect on the reverse side, acting like a speaker skin. This is the reason why we can hear low frequencies from an insulated room. The best way to reduce the maximum amount of unwanted sound coming from the corridor is to install a soundproof door. These are expensive, but a cheaper alternative is to buy a door sound-blocker kit as shown on figure 33.



Figure 33 – Door Seal kit

### 9.2 Echo reduction

Another issue around soundproofing is resolving are echo problems in the room. Previously mentioned in this document, due to the restricted nature of interview rooms, there is usually a lot of echo. Echo is created by sound bouncing between the walls and the ceiling. Echo does not appear to be very intrusive to the human ear, but when captured by a microphone, it becomes a greater issue. So, its removal is important.

There are different ways to remove echo from a room. If your room has yet to be built, install a type of wall that is designed to prevent echo. It is more expensive but worth it. Retro installing of acoustical tiles on the walls is another solution, although occasions have occurred when an interviewee left alone has detached them from the walls! A solution that is inexpensive and proven to work well is to install a suspended ceiling. The ceiling tiles can prevent sound bounce. Verify with a home improvement retailer which tiles work best for your application. Also install the same tile system on all walls, only about 12 to 18 inches from the ceiling. Finally, cover the floor with carpet. It is easy to clean and will help in dampening the echo. These changes can make a profound difference to the quality of your recording.



Figure 35 – Wall Acoustical tiles



Figure 34 – Ceiling Acoustical tiles

### 9.3 The furniture

The room should contain a table and three chairs. One chair should be available for an observer, such as a parent or spouse. The interviewee chair should be basic with no arms or swivel seat to prevent movement. The interviewers chair should be more comfortable than the interviewees. It is important because soliciting information from suspects, victims and witnesses is difficult enough without creating additional barriers within the room environment. The most important consideration is that the room should afford the subject privacy. Very simply, it is much easier to speak with a single person than to multiple individuals. Secondly, the environment should not remind the subject of the consequences awaiting them should they decide to confess. After all, trying to avoid these consequences is what motivates the guilty subject's deception. Finally, the investigator should be aware of how the room will be perceived by a jury viewing a videotaped interrogation. Will the room's appearance raise issues of duress or coercion?

# **10** Security

Security is a major concern in interview recording. Content of this type is very sensitive, and confidential interviews should never end up appearing in the wrong hands. There are devices that ensure the content does not end up in wrong hands.

#### **10.1** Video File encryption

There are many technologies that offer video file encryption. The overriding principle is the need to use a key to view the content. If a DVD with encrypted video files goes missing, there is no danger of it being accessed without the key. This may be very reassuring, but the disadvantage of this security is that it slows down the viewing process.

Similar technologies also exist for video streaming. It is possible to encrypt the video being streamed and prevent unauthorized viewing. As with video file encryption, there are a lot of options to choose from, and it is important to research which product will work best for your situation.

The other key security feature is being able to guarantee that a file presented before a judge has not been altered or tampered with in any way. There is an easy and a complex way to achieve this. The easy way is to timestamp every picture in the recording. Once time stamped, it is obvious if the video has been edited, as some the pictures will be missing, and the time will jump. For this reason, it is important that the Interview recording software provides time stamp functionality.



Figure 36 – Video Encryption

# **11** Original file confirmation

The objective of hash technology is to ensure that the files downloaded are the same as the originals and have not been altered in any way.

MD5, SHA-1 and SHA-256 hash products are cryptographic algorithms designed to produce a string of characters of a fixed length, regardless of the size of the input data.

A minimal change in a file will totally transform the result of the hash value. As an example, the hash value for a "word" document with "officer" written on it will produce the following hash:

#### 2D84C92E963AF558E1A1512B711FFD59D1C0F05D3ED8BECC32FC5E3C53EBCD3B

If we add an "s" to our document to change it to "officers", the hash value will become the following:

1376F93F651D9ABC04CE16273DD6A820F134CFCF286A9459FAC2BFABD732C7C8

💹 Windows	PowerShell		10-01	$\times$
Windows Powe Copyright (C	rShell ) Microsoft Corporation. Tous droits réservés.			^
Testez le no	uveau système multiplateforme PowerShell https://aka.ms/pscore6			
PS C:\Users\	Claude Turcotte> get-filehash d:/officer.docx			
Algorithm	Hash	Path		
SHA256	2D84C92E963AF558E1A1512B711FFD59D1C0F05D3ED8BECC32FC5E3C53EBCD3B	D:\officer.doc>	¢	
PS C:\Users\0	Claude Turcotte> get-filehash d:/officers.docx			
Algorithm	Hash	Path		
SHA256	 1376F93F651D9ABC04CE16273DD6A820F134CFCF286A9459FAC2BFABD732C7C8	D:\officers.doo	x	



When comparing the result of the hash function to the result expected, if the values are the same, the file hasn't been corrupted or tampered with or otherwise altered from the original.

MD5, SHA-1, and SHA-256 are different hash functions. Interview recording software that includes hash function will create a signature for each file generated during the recording. This way, files can be downloaded and distributed, and the hash function will confirm the files origin to ensure it hasn't been corrupted during the distribution process. As we saw before, even a small change to the file will dramatically alter the hash function.

This can also be useful if a file was obtained from an unofficial source and requires confirmation of legitimacy. Looking up the hash function of that specific file and running it through the hash function on your computer, will confirm that it matches the hash value expected.

Note that "collisions" have been found with the MD5 and SHA-1 functions. These are multiple different files - for example, a safe file and a malicious file - that result in the same MD5 or SHA-1 hash. That is why SHA-256 is the preferred option whenever possible.

### 11.2 How it works?

It is important to identify the source of the files; in simple terms, on which computer the files have been generated. In my previous example, the hash value for a "word" document with "officer" written on it, will produce the same hash on any computer. To guarantee the origin of the signature, we also need to include information about the computer that generated the signature. So, each computer generating signatures has their own certificate. The certificate can be generated by the police station itself, or a higher entity if there are reasons to have the origin of the signature certified by a higher entity.

eneral	Details	Certification Pat	h	
Show:	<all></all>		~	
Field			Value	^
Ve	rsion		V3	
Se	rial numbe	er	76515c5b78bcecb92c51e4d99	
Sig	nature al	lgorithm	sha256RSA	
Sig	nature h	ash algorithm	sha256	
Iss	uer		Maestrovision Signature CA, M	
Va	lid from		Thursday, May 13, 2021 3:52:	
Va	lid to		Friday, May 9, 2036 3:52:42 PM	
		144	Edit Properties Copy to File	

Figure 38 - Certificate

The certificate includes a private key allowing the generation of a public key. The "private key" is like the stamper. It has its own characteristics and capable of generating stamps representing "the public key" in our example.



Figure 39 - Public vs private key

The "public key" as its name suggest, is public and can be distributed to anyone. It is a file, combined with the signature file, that will allow you to confirm the authenticity of a suspected document.



Figure 40 - Files generated by a an Interview Recording

On figure 40, we see a list of files that could be generated by an Interview Recording system. The list includes video files, text files, thumbnail files, etc. There cannot have a dispute about the thumbnails because they are totally irrelevant. Therefore, the relevance is clear for video files, audio files and text files. This is the reason why in figure 40, there is a document signature for each video file and for the text file.

For example, in court the lawyer disputes the validity of a recording pretending it is not conforming to the original. The file in question is "CTURCOTTE-PC---20200719-091438.mp4". To conform the validity if the file, you will need to install the "public key" on your computer by clicking on "install certificate" after double-clicking on the certificate file on Figure 40.

1	Certificate Information
Withi	ndows does not have enough information to verify s certificate.
-	
	Issued to: PostePascal
1	Issued by: Maestrovision Signature CA
1	
	Valid from 5/13/2021 to 5/9/2036
	Valid from 5/13/2021 to 5/9/2036

Figure 41 - Installation of a public Key

Once it is done, using the signature file named "CTURCOTTE-PC---20200719-091438.mp4.sign" and using the executable "openSSL.exe" on the disputed file, you will get the confirmation if the file has been altered from the original, and if the origin is from the right computer.

# **12** Secured File transfer demystified.

There are multiple ways of transmitting data from point A to point B, or from point A to multiple points. From the mostly used, one is RTP (Real Time Transport), a technology developed by surveillance camera manufacturers, another one is HTP developed by Apple Corporation. We cannot really talk about pros and cons because each technology has its own purpose. While RTP has been developed for real-Time transport, HLS is a better technology for secured (nonreal-time) File Transfer. Therefore, in a real "realtime transfer" emphasis is done on delivery data on-time. The downside of "Real-Time Transport" is that videos need to be there on time. If the data comes too fast, the system will drop video frames, if the data comes too late, the system will repeat the same video frame so the viewer perception is not altered.

Security in Interview Recording is not normally an issue inside the police department facilities if the interviews are centralized to a cloud service, while using IP cameras in real-time. The technology that will meet your requirements, in terms of transfer, depends on the equipment you are using to record your interviews.

### 12.1 Security Real-Time Transport Protocol (SRTP)

IP camera technology uses a distinct set of protocols to set up sessions between end points, and a distinct protocol to transmit the media streams. The standard protocol used to exchange media streams is RTP (Real Time Protocol). RTP streams can be intercepted and manipulated. This has led to the development of SRTP (Secure Real Time Protocol). The use of SRTP requires a mechanism to exchange cryptographic keys before sending any media. Therefore, key management protocols such as MIKEY and SDescriptions are proposed to provide the necessary keying material and management mechanisms, to maintain the security of multimedia sessions. Currently, there is not a single key-exchange mechanism considered to be the industry standard, because each has strengths and weaknesses. The most logical approach to combining SRTP with the appropriate key-exchange mechanism is to identify the requirements that need to be supported by the environment and evaluate the applicability of each of the existing key management mechanisms.

The designers of SRTP focused on developing a protocol that can provide adequate protection for media streams, but also maintain key properties to support wired and wireless networks, in which bandwidth or underlying transport limitations may exist. Some of the highlighted properties are as follows:

- The ability to incorporate new cryptographic transforms.
- Maintain low bandwidth and computational cost.
- Conservative in the size of implementation code. This is useful for devices with limited memory (for example, cell phones).
- Underlying transport independence, including network and physical layers that maybe used, and perhaps prone to reordering and packet loss.

The application that implements SRTP must convert RTP packets to SRTP packets before sending them across the network. The same process is used in reverse to decrypt SRTP packets and convert them to RTP packets. Figure 43 depicts this process.



#### Figure 42 – SRTP Encryption

After the application captures the input from a device, it encodes the signal using the negotiated or default encoding standard and creates the payload of the RTP packet. Next, the RTP payload is encrypted using the negotiated encryption algorithm. The default encryption algorithm for SRTP is AES (Advanced Encryption Standard) in *counter mode* using a 128-bit key length. This mode, along with the *null* mode, is mandatory for implementations to be considered compliant with the IETF RFC and interoperate with other implementations. SRTP also recommends the use of AES in f8 mode to encrypt UMTS (Universal Mobile Telecommunications System) data. This mode also uses the same size for the session key and the salt as in counter mode. The use of AES in SRTP allows processing the packets even if they are received out of order, which is a desirable feature for real-time applications.

# **13** Why HLS is the future of streaming?

HTTP Live Streaming (HLS) is an adaptive, HTTP-based streaming protocol that sends video and audio content over the network in small, TCP-based media segments that get reassembled at the streaming destination. The cost to deploy HLS is low because it uses existing TCP-based network technology, which is attractive for CDNs looking to replace old (and expensive) RTMP media servers. But because HLS uses TCP, Quality of Experience (QoE) is favored over low latency and lag times can be high (as in seconds instead of milliseconds).

HLS was originally developed by Apple Inc. as a protocol to stream media to Apple devices. Apple has since developed HLS (push), which is an open-standard streaming protocol on the contribution side that is available to all devices. Currently, HLS supports video that is encoded using H.264 or HEVC codecs.

An advantage of HLS is that it is designed to adapt to different network conditions. Different versions of the stream are sent at different resolutions and bitrates. Viewers can choose the quality of stream they want. HLS also supports multiple audio tracks, which means your stream could have multiple language tracks that users can choose from. Other perks include support for closed captions, metadata, Digital Rights Management (DRM), and even embedded advertisements (in the not-too-distant future). The framework is all there.

Secure streaming over HTTPS is supported, as well as MD5 hashing and SHA hashing algorithms for username and password authentication.



Multiple Resolutions and audio tracks



Easier and less expensive to deploy

Figure 43 - HLA Advantages



Plays nice with Firewalls and Proxies

### 13.2 Benefits

- High-quality video (up to 4K) and audio delivered reliably across poor-quality networks where low latency is not a requirement.
- Easily traverse firewalls.
- Adapts to different network conditions and sends multiple video streams at different resolutions and bitrates.
- Multiple audio track support for things like multi-language streams.
- Supports metadata and other enhanced features.
- Economical to deploy and easy to scale using traditional network servers and technology.
- Secure live streaming using HTTPS and authentication algorithms MD5 hashing and SHA.

#### 13.3 How HLS works

The approach is a lot like a file transfer. Media segments stream over HTTP port 80 (or port 443 for HTTPS), which is typically already open to network traffic. As such, the content can easily traverse firewalls with little to no IT involvement.

HLS uses an MP4 stream container with a configurable media segment duration, as well as a configurable playlist size for reassembling the media segments at the ingestion server.

Because HLS uses TCP-based technology, the network packet loss and recovery method is intensive. That is one of the reasons for the increased latency. Although some control over the media segment size is available, the ability to reduce latency is limited – especially if the ingestion server requires a specific size of media segment.

#### 13.4 HLS application

HLS is ideal for Interview Recording streaming. It is still the standard for streaming to mobile devices and tablets. You can also use HLS to stream to a CDN that does not support RTMP when low latency isn't a requirement. It's important to note that RTMP is already being deprecated by more and more CDNs. HLS is also well suited to securely stream corporate training and town halls over private Local Area Networks (LANs) when low latency isn't a requirement and network conditions are poor (assuming the network supports HLS).

# **14** Software Manufacturers Comparison

	Axon	CaseCracker	iRecord	Liberty	MaestroVision	Star Witness
Type of camera	IP	IP	IP USB	IP USB	HD-SDI USB	IP
Type of audio	unbalanced	unbalanced	unbalanced	unbalanced	balanced	balanced
Player Interface	One picture	P in P	Multiview	P in P	Multiview	P in P
Player software	none proprietary	NO	proprietary	proprietary	Web browser	proprietary
Video Format	h.264	h.264	h.264	h.264	h.264 MPEG-2	MPEG-2
Monitor Recording	no	no	no	no	yes	no
Remote start & stop	no	Full control	no	no	Full control	no
Storage	Cloud	On-premises	Cloud	none	Cloud On-Premises	On-premises
Annotations	no	yes	yes	yes	yes	yes
Thumbnails	no	no	yes	no	yes	no
Timestamp on video	no	yes	no	no	yes	yes
Portable Solution	no	yes	no	no	yes	yes
Hardware Warranty	3 years	5 years	1 year	3 years	unlimited	3 years
Software Warranty	5 years	3 years	1 year	3 years	unlimited	1 year
Technical Support	6h00-22h00 Eastern	8h00-17h00 Mountain	8h00-18h00 Eastern	9h00-17h00 Eastern	24/7	8h30-17h30 Eastern

Figure 44 – Software Manufacturers Comparison

# **15** Suggested Minimum Interview Room Requirements

As a public entity, you are usually required to go through a bidding process to purchase expensive equipment. As I mentioned before, Interview Recording technologies are not as simple as we imagine; many features need to be considered. This requires expertise that often your IT personnel doesn't have. To help you designing your request for proposals, I created a list of suggested Minimum Interview Recording Requirements.

#### **15.1 Software User Interface**

The recorder program must be password-protected by each individual user when individuals log in, and the system must automatically load the Recorder application as soon as credential verification is done upon boot-up.

Permissions must be configurable based on the following account levels, and only those with Administrative access should be able to adjust accounts and core settings:

- Administrative user
- Standard users

#### **15.2** Session Recording and Playback Functionality

- The recording program for both the audio and video must be initiated by the user with one button.
- The recording program feature must prompt the user to enter session-specific metadata, including subject, case number/incident, interviewer, interview location, room number, time and date.
- Folder(s) with recordings must be able to be configured by an Administrator, with options to save recording file(s) in a specific folder assigned by an Administrator (for instance, recordings of a user to be saved in a folder configured by an Administrator as "USER\mydocuments\recording".
- Playback windows must support Start and/or Play, Stop, Pause, Forward, and Reverse controls, from the beginning of file, end of file, frame by frame, and shuttle (Linear control slider), and must provide a current position time indicator.
- The recording program must play, pause, and fast forward or rewind in a variety of speeds.
- The recording program must advance forward or backward in a variety of speeds.
- The recording program must allow for slider bar rapid movement within a session.
- The recorder must allow Bookmarks to be established at any point in the file, to allow the user to reposition the audio/video playback at a defined bookmark. This must be possible in real time, and afterwards upon review of the completed file.

#### **15.3 Session Management**

- Manual deletion of recorded sessions must be able to be performed by the user.
- User must be able to select a session for playback from a list or choose one based on atextbased search.
- User actions such as: interviewer, subject, time, case number, or annotation containing a desired text string, etcetera, must be able to be recorded in an event log with text search capability.

#### **15.4 User Annotations**

- Flags or annotations must be able to be added by the user to highlight specific areas in a recording session.
- The recording device must have the ability to add searchable text annotations to any video frame.

#### 15.5 Audio / Video

- The recording device audio sampling must be at a minimum of 16 kHz, 16 bits persample.
- The recorder must have a real-time audio and on-screen textual alert, which indicates to the user if sound levels are too low and that the recording is paused as a result.
- There must be support for four video capture input sources, at a minimum.
- The system must offer confidence monitoring of a recording. (This means being able to play a recording while in progress.)
- Resolution of the recording device's settings must be a minimum of 640 x 480 and the device must be able to record at a minimum frame rate of thirty (30) frames persecond.
- Audio notification to the user is required when audio and video input is absent.
- High-definition video capture format must allow for 720 (720x486p 60 Hz), 1080 (1920x1080i 60Hz), and 1080 (1920x1080p 60Hz).
- The system must record and allow separate playback of any of the individual video channels.
   Users can customize the playback so that any video channel may be played individually, or multiple video channels may be played back together fully synchronized.
- The system must allow the user to manage each video channel individually.
- The system must offer the ability to record a device like a touch screen monitor.

#### **15.6 Searching**

- The system must be able to do a text-based search for information, one session at a time or multiple sessions simultaneously.
- The system must be able to search within one recording event, by the following criteria: interviewer, subject, time, case number, and annotations containing a desired text string.
- Part of the initial recording process must include capture from the user of critical case-specific metadata, to be used to search for and retrieve specific recording files. Text entry of this metadata by the user must be performed prior to the recording session and remain editable throughout until it is finalized. This metadata must include at least six (6) variable caption fields, customizable by an Administrator, and the system must warn the user to prevent any attempt to navigate away from this function.

### **15.7 Media Exporting**

- The system must prompt the user if the proper media configuration requirements are not available, to allow the user to remedy the situation.
- The system must be able to export audio and video, user-defined images, and/or text-based or entire session to DVD for playback. In addition, the recordings must be able to be burned to a DVD and for the DVD to be catalogued into the system.
- The system must allow burning long sessions to multiple DVDs and must be able to truncate files exceeding the medium capacity onto multiple DVDs. The metadata associated with the truncated portion of the recording must also reside on the proper media. The system must be able to prompt the user as to the number of required disks before the start of the process, as well as prompt the user to change disks as required throughout the process.
- The system must be able to output the recording results onto both DVD and USB thumb drive media.
- The system must allow for the creation of audio/video files on external media (DVDs) at the conclusion of a recording session.
- The system must be able to export recordings in MP4 video/audio format readable using VLC or Windows Media Player.
- Archival DVD must be able to be burned on single and dual layerdiscs.
- The system must be capable of spanning large files to as many DVDs as is required.
- The recording file must be its own container file that encapsulates the video, the audio, metadata, security, and validation components.
- Both the process of burning to DVD, and copy to USB media, must provide the option of including all the contents from a predefined folder to be included on saidmedia.
- Audio files: the system must export an entire session for transcription in a WAVformat.

- The output media must contain original recordings, an MP3 or PCM WAV file of the audio portion of the recording, a SHA256 verification hash of the original recording, a player program to allow for playback of the recording file, as well as a folder and its entire content. This folder must be defined within the administrative configuration.
- Administrators must be able to select that the USB medium be formatted in FAT32, XFAT or NTFS.
- Still Images: the system must export individual frames for review in JPEG or BMP formats.
- The system must be able to export annotations and flags in a CSV and PDF formats.
- The system must support the saving of bookmarks and associated recording annotations into a standard PDF document container (file), with links to an industry-standard audio/video file that is saved inside the PDF container.
- The system must perform concurrent burning to two (2) DVDs, and/or copying to two (2) data keys, not just consecutively.

### 15.8 Security

- Secure Hash Algorithm (SHA-256) must be applied to video, audio and text files for authentication.
- The recorder must ensure that the integrity of the recording is the priority of the system. This
  includes the integrity of the recording in case of systems failure, up to the point of the failure.
  Should a failure occur during the burning of the file copy process to the medium, the system
  must provide the user with appropriate feedback as well as the ability to restart the process of
  media export.
- The system must allow the user to be able to lock the workstation prior to, during and after the recording session, which can only be unlocked using his or her credentials or that of an Administrator.
- The system must keep a log accessible to Administrators, of all events. It should include login credentials, dates, times of session, recording start/stop, errors, and critical system status.
- Standard users must have restricted access to administration and systems functionality, in both local and domain modes. Access to any function shortcut, other than a shutdown or logout, must be disabled. Any method by which a Standard user may gain access to the operating system, system configuration, files and folders must be disabled. In short, the standard user must be limited to the Recorder applications only, and its immediate recording functions.
- The system must support a watermark on all video frames that includes a custom, room-specific tag and the time and date of the recording. The size, font, color, and position of the watermark must be configurable. This data must be able to be modified by the Standard user for each recording conducted.

- Credential and authentication must be maintained for a network-based system when the system is disconnected from the authentication server. This provision considers that a user must have been authenticated against the server at least once prior to the disconnection from the authentication server.
- Date and time and seconds can be shown on all video and exported media included on all playback and recordings.
- The system must include a searchable audit log which includes login, usage, and time stamp of events.
- Video and audio must be encrypted using SHA256 Protocol.
- Cryptographic hash fingerprint must be able to be exported (for example, PDF) to verifyvideo integrity.
- The recorder's administrative functions must be accessible under any login.
- Access protection to the administrative functions is in place, using a hot-key combination and administrator password. Both the key combination and administrator password must be configurable within the administrative configuration utility.
- The system must operate under two modes, under two different sets of credentials. One will be standard user, the other Administrative users. Standards users will only have access to their own recorded files and limited to standard user functionality. The Administrative credentials shall give access to all functions of the recorder, including permissions to other users' files.

### **15.9** Network/ Player support

- The system must allow for viewing of the interview audio and video recording, utilizing standard Windows<sup>®</sup>/Apple<sup>®</sup> audio and video software, without the need to install proprietary playback programs on the monitoring computer.
- The player program must provide support for ESDC-encrypted USB key to be used for transcription.
- The system must support audio / video playback of the recording files on both Microsoft Windows PC and Apple Mac computers.
- The audio/video files created by the system must not require installation of drivers or require the registry or other system configuration on the client/playback machine in order to review the original recording.

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